

DISCOVERY OF A NEW KITTLITZ'S MURRELET NEST: CLUES TO HABITAT SELECTION AND NEST-SITE FIDELITY

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ABSTRACT—On 13 June 1993, a new Kittlitz's murrelet (*Brachyramphus brevirostris*) nest was discovered near Red Mountain on the Kenai Peninsula, Alaska. The nest was on a 22° slope at about 900 m elevation with a northeast aspect, and contained a 60.2 × 40.6 mm egg that weighed 49.0 g. Downy feathers and weathered fecal material found at the nest indicated re-use from a previous year, suggesting possible nest site fidelity. The nest was located in an area scoured by winds and free of snow during early spring, suggesting that this may be an important meso-scale factor influencing selection of nesting habitat. Proximity to suitable foraging habitat, particularly sheltered bays and glacial river outflows, may affect breeding habitat choice over larger spatial scales.

Key words: Kittlitz's murrelet, *Brachyramphus brevirostris*, Alaska, seabird, glaciation, nest site, nesting habitat

The Kittlitz's murrelet (*Brachyramphus brevirostris*) is one of the rarest seabirds in North America and most aspects of its biology remain obscure. Limited data suggest a total world population of about 20,000 birds (van Vliet 1993). Except for small populations in the Russian Far East (Konyukhov and others 1998), most Kittlitz's murrelets breed in Alaska. Populations have been affected in recent years by gill-net mortality, oil pollution, and changes in availability of preferred forage fish (van Vliet and McAllister 1994; Piatt and Anderson 1996).

Genetic studies indicate that the Kittlitz's murrelet diverged from its congener, the Marbled murrelet (*B. marmoratus*), about 1.6 to 2.2 million years ago during the onset of the Pleistocene ice age (Pitocchelli and others 1995; Friesen and others 1996). The Kittlitz's murrelet nests on the ground, most commonly in glaciated regions (Day and others 1983; Day 1995). In

contrast, the marbled murrelet breeds primarily in old-growth coniferous forests, although a small percentage (about 5%) in Alaska nest on open ground (Piatt and Naslund 1995).

The nesting biology of the Kittlitz's murrelet is poorly known. To date, only 19 confirmed nests have been described, all fortuitously discovered and all but 2 located in Alaska (Fig. 1; Day and others 1983; Day 1995; R.H. Day, Alaska Biological Research, Fairbanks, AK, pers. comm.). Kittlitz's murrelet nest sites are found on alpine talus slopes at high to moderate elevations in their southern range and on barren lowlands in the northern part of their range (Day 1995). Kittlitz's murrelets build only a rudimentary nest, usually at the base of a large rock. Their single egg is typically pale olive-green with brown mottling and averages 60 × 37 mm (Day and others 1983).

In this paper we describe a new Kittlitz's

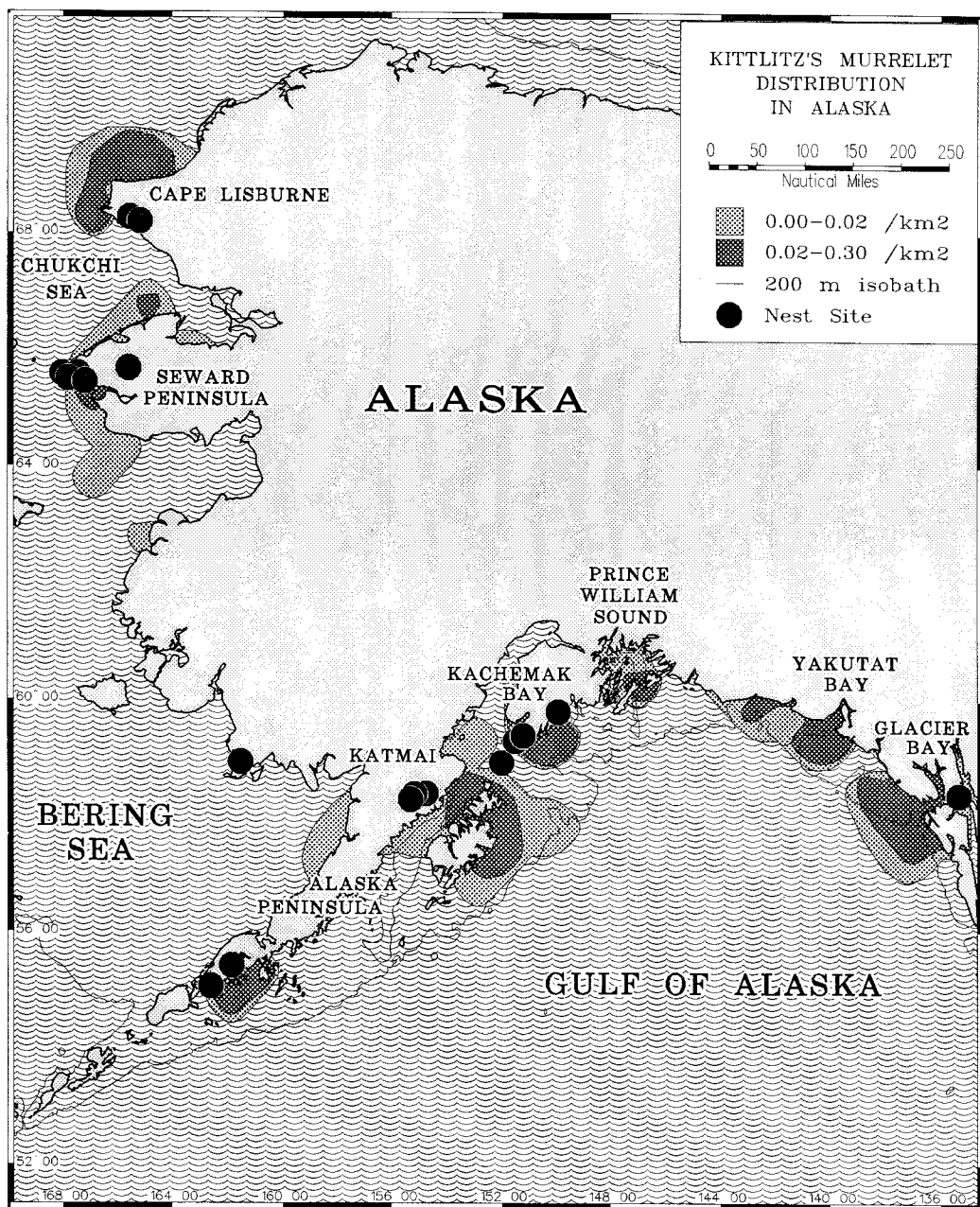


FIGURE 1. Distribution of Kittlitz's murrelets at sea (shaded contours) and nest sites on land (circles) in Alaska. At sea distribution data are from USFWS archives (see Piatt and Ford 1993). Nest sites are from Day and others (1983) and Day (1995); 1 site from Atka Island in the Aleutians is not shown.

murrelet nest site found 13 June 1993 on the Kenai Peninsula near Kachemak Bay, Alaska, and provide evidence that the nest site was used in a previous year. We consider some factors that

may contribute to selection of breeding habitat at various spatial scales and speculate on the evolutionary significance of nesting habitat choice in the Kittlitz's murrelet.



FIGURE 2. Kittlitz's murrelet nest and egg described in this note, located near Red Mountain on the Kenai Peninsula.

METHODS AND RESULTS

On 13 June 1993, 3 persons hiking on a peak near Red Mountain ($59^{\circ}22'N$, $151^{\circ}30'W$), at the head of the Windy River Valley, Kenai Peninsula, Alaska, flushed a bird from the ground and subsequently discovered a single olive-green egg on bare ground. On 19 June 1993, we visited the site accompanied by K. Bloom, who was with the group that originally discovered the site. We flushed a Kittlitz's murrelet from its nest and made the following observations of the nest site and egg.

Nest site

The nest was on a scree-covered, 22° slope, about 50 m below the summit of an isolated mountain peak (about 950 m elevation). The slope faced northeast and was located on the shoulder of a ridge that ran from the top of the peak nearly to its base. The nest was at the base of a flat-faced boulder (about 45 cm tall) that was larger than most of the rocks around it (Figs. 2 and 3). The face of this boulder was ori-

ented slightly more to the east than the surrounding slope.

Nest

The nest cup was round with a 12.6-cm diameter inside and a depth of about 3 cm (Fig. 2). A rim of small rocks had been built up around its circumference. Old fecal material was buried in the rocks around the top of the nest. Many small eggshell fragments were buried in the small rocks that formed the base of the nest cup. Down feathers were imbedded in dead vegetation at the periphery of the nest. A dispersed clump of down feathers and a few black and white contour feathers were buried in rocks and on the undersides of vegetation mats approximately 1 m from the nest. One contour feather had a piece of down attached to its tip, indicating that it was from a nestling.

Egg

The egg measured 60.2×40.6 mm and weighed 49.0 g. The background color was olive-green and markings were brown, gray, and



FIGURE 3. Habitat surrounding the Kittlitz's murrelet nest found near Red Mountain on the Kenai Peninsula. The nest is immediately downslope from the large rock near center, with arrows pointing at nest from both sides.

lavender in color. The egg was fairly evenly marked with small (≤ 2 mm) irregular spots, specks, and scrawls, and there were a few scattered large splotches (3 to 7 mm), primarily around the blunt end.

Vegetation

The area surrounding the nest was sparsely vegetated. In a 100-m² plot centered on the nest, 11% of the ground was covered by vegetation (not including lichens) on 9 July 1993. This density was typical of the entire mountain top, but was double what we had estimated visually prior to measuring vegetation density in the plot. Plants were typical alpine species and included the dicots *Saxifraga oppositifolia*, *Silene acaulis*, and *Draba* spp., as well as an assortment of mosses and lichens. The nest was 10 to 20 cm from the nearest vegetation.

DISCUSSION

The buried eggshell fragments in the nest cup revealed that it had been used during a prior breeding season and suggests that at least some Kittlitz's murrelets exhibit nest-site fidelity. Although commonly observed in other alcid species, nest-site fidelity has never been reported for the Kittlitz's murrelet and infrequently for the marbled murrelet (Naslund 1993; Naslund and others 1995). Weathered fecal material found around the nest cup further indicates that the nest had contained a chick in a previous year. Clumps of down found around

the nest site probably came from a nestling that plucked its down prior to fledging; marbled murrelet nestlings do this 12 to 48 hr prior to fledging and often leave behind clumps or rings of down on the nest (Nelson and Hamer 1995). Re-use of this apparently productive nest site begs the question: what factors are important to Kittlitz's murrelets in selecting and re-using nesting habitat?

The nest site described here was typical for Kittlitz's murrelets in the southern part of their range (Day and others 1983), where the species appears to favor nesting on remote, medium- to high-altitude alpine slopes with loose scree substrate. The nest cup is usually located immediately downslope from a large rock that may provide both a warmer microclimate and shelter from rolling debris. Such protection may be an important small-scale determinant of nest-site selection (Day 1995).

Day (1995, 1996) proposed the aspect of Kittlitz's murrelet nest sites may be related to elevation, with birds that nest at higher altitudes tending to select slopes with a southern aspect to facilitate early snow melt. Given a restricted window of time to complete incubation and chick rearing (about 60 days in the marbled murrelet [Sealy 1974]), it follows that snow-free nest site availability early in the season is likely to be an important factor in meso-scale selection of Kittlitz's murrelet nest sites.

For this reason, persistent wind scouring and

snow accumulation patterns could be an important determinant of the location of nest sites. During aerial surveys in late May 1994 we observed that much of the nesting ridge described here was free of snow, whereas most of the peak, including the south-facing slopes, remained snow-covered. Wind forces are concentrated at ridges and other topographical irregularities, limiting accumulation of snow over winter. Early snow-free habitat is probably more predictable in wind-scourged areas than in those areas affected only by solar radiation, which would vary considerably with snow depth among years. Day (1995) notes that Kittlitz's murrelets are reported to lay eggs in bare spots amid snow. We believe that, at least at meso-scales, such bare spots relate more to wind patterns than to aspect and solar melting. A predictable snow-free habitat may be the most critical factor determining whether nest sites can be re-used year after year.

At the largest spatial scale, the present day distribution of Kittlitz's murrelet at sea and inland reflects their ancient association with glacial ice (Fig. 1). Kittlitz's murrelet populations show a disjunct distribution among mountainous areas with large present-day glacier fields (Glacier Bay National Park, Yakutat Bay, Prince William Sound, Kenai Peninsula, Kachemak Bay), remnant high-elevation glaciers (Kodiak Island, Katmai National Park, Alaska Peninsula, Atka and Attu Islands), and recently deglaciated coastal mountains (Seward Peninsula, Cape Lisburne). Presumably, this pattern of distribution is a consequence of post-Pleistocene adaptations for nesting on recently deglaciated talus slopes. Because *Brachyramphus* murrelets are the only alcids that do not breed on predator-free islands, and the only alcids with cryptic breeding plumage, we conclude that the choice of breeding habitat by Kittlitz's murrelet largely reflects natural selection for predator-free inland environments.

Another important factor influencing large- and meso-scale choice of nesting areas must be proximity to suitable foraging habitat. Most murrelets are distributed at sea in large, sheltered embayments such as Cook Inlet, Prince William Sound and Glacier Bay. Within these waters, Kittlitz's murrelets often forage in "milky" waters at the mouth of glacial river outflows where fresh water lenses layer over more saline ocean water below. There are ex-

ceptions to these generalizations, but the common observation of murrelets associated with glacial river outflows in many areas deserves further study.

The nest site described here was located about 15 km from both Kachemak Bay, to the northwest, and the Gulf of Alaska, to the south. There appeared to be much suitable Kittlitz's murrelet nesting habitat in the Red Mountain area, and this region of the Kenai Peninsula may support many other Kittlitz's murrelet nests. Indeed, 1 of the 14 nests reported in Day and others (1983) was located in the Windy River valley, very near the nest site described here.

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